CLAIMS

What is claimed is:

1. A method for etching a feature in an etch layer through a mask over a substrate, comprising:

placing a substrate in a process chamber;

providing an etch plasma to the process chamber, wherein the etch plasma begins to etch;

etching a feature in the etch layer with the etch plasma;

ramping at least one etch plasma parameter during the etching of the feature to optimize plasma parameters to the changing etch depth and etching with the ramped plasma until the feature is etched to a feature depth.

2. The method, as recited in claim 1, wherein the ramping of at least one etch plasma parameter during the etching of the feature to optimize the plasma parameters is selected from at least one of providing a ramp that increases etch aggressiveness with respect to etch stop to increase feature depth, providing a ramp that increases etch aggressiveness with respect to tapered profile, providing a ramp that increases overall selectivity to the mask by ramping from recipe with higher mask selectivity to lower selectivity, providing a ramp that moves bow location to decrease overall bowing, and providing a ramp that reduces overall striations.

3. The method, as recited in claim 2, wherein the etch layer is a single layer.

4. The method, as recited in claim 3, wherein the single layer is a uniform layer.

5. The method, as recited in claim 4, wherein the ramping occurs over a time period of greater than 30 seconds.

6. The method, as recited in claim 4, wherein the ramping occurs over greater than 50% of the duration of the etch.

7. The method, as recited in claim 5, wherein the ramping is a non-linear ramping.

8. The method, as recited in claim 3, wherein the etch layer is a dielectric layer.

9. The method, as recited in claim 3, wherein the ramping provides a ramping that increases etch aggressiveness with respect to etch stop.

10. The method, as recited in claim 1, wherein the ramping decreases etch selectivity between the etch layer and the mask.

11. A semiconductor chip formed by the method of claim 1.

12. An apparatus for performing the method of claim 1.

13. An apparatus for etching a feature in an etch layer through a mask over a substrate, comprising:

a plasma processing chamber, comprising:

a chamber wall forming a plasma processing chamber enclosure;

a substrate support for supporting a substrate within the plasma processing chamber enclosure;

a pressure regulator for regulating the pressure in the plasma processing chamber enclosure;

at least one electrode for providing power to the plasma processing chamber enclosure for sustaining a plasma;

a gas inlet for providing gas into the plasma processing chamber enclosure; and

a gas outlet for exhausting gas from the plasma processing chamber enclosure;

a gas source in fluid connection with the gas inlet,

a controller controllably connected to at least one of the gas source the at least one electrode, the pressure regulator, the gas inlet, and the gas outlet, comprising:

at least one processor; and

computer readable media, comprising:

computer readable code for ramping at least one etch plasma parameter during the etching of the feature to optimize plasma parameters

according to etch depth and etching with the ramped plasma until the feature is etched to a feature depth.

14. A method for etching a feature in an etch layer through a mask over a substrate, comprising:

placing the substrate in a process chamber;

providing a first etch plasma composition to the process chamber, wherein the first etch plasma composition begins etch a feature in the etch layer;

providing a second etch plasma composition, wherein the second etch plasma composition continues to etch the feature in the etch layer; and

providing a third etch plasma composition, wherein the third etch plasma composition continues to etch the feature in the etch layer, wherein the third etch plasma composition more aggressive with respect to etch stop than the second etch plasma composition and the second etch plasma composition more aggressive with respect to etch stop than the first etch plasma composition.

15. The method, as recited in claim 1, wherein the first etch plasma is more selective than the second etch plasma and the second etch plasma is more selective than the third etch plasma.